

IN THE CLAIMS

1. [Currently Amended] A pulsed power application system for an x-ray tube comprising:

an x-ray tube having an anode and cathode, said x-ray tube configured for diagnostic imaging;

a power supply configured to provide optical energy and an anode-to-cathode gap voltage via electrical energy, said anode-to-cathode gap voltage is greater than 150kV, wherein said optical energy and said gap voltage are pulsed resulting in a pulsed x-ray radiation; and

a means for transferring said optical energy and said electrical energy from said power supply to said x-ray tube.

2. [Currently Amended] The pulsed power application system of claim 1, wherein said optical energy and said gap voltage is pulsed, said gap voltage is pulsed by pulsing an outputthe extraction voltage of said power supply.

3. [Currently Amended] The pulsed power application system of claim 1, wherein the x-ray tube is bipolar and said anode is connected to a positive terminal of a first power supply of said power supply and said cathode is connected to a negative terminal of a second power supply of said power supply, remaining terminals of said first and second power supplies are referenced to ground.

4. [Currently Amended] The pulsed power application system of claim 1, wherein said anode is referenced to ground potential and said cathode is connected to a negative terminal of said second power supply.

5. [Original] The pulsed power application system of claim 1, wherein said optical energy is generated by one of a laser, an LED, and an electroluminescent device in operable communication with said power supply and configured to generate pulsed photon energy at a suitable wavelength to optimize electron emission from an electron source.

6. [Original] The pulsed power application system of claim 1, wherein said cathode includes a surface configured as an electron source to generate electrons triggered by photons directed at said surface, said photons generated from said optical energy.

7. [Original] The pulsed power application system of claim 6, wherein said surface of said cathode is a photo-emitting surface including at least one of clean metals, semi-conductor crystals, coated metal materials, coated oxide materials, and cleaved crystal edges.

8. [Original] The pulsed power application system of claim 7, wherein said electron source includes a field emission array (FEA).

9. [Original] The pulsed power application system of claim 8, wherein said field emission array (FEA) includes a Spindt-type field emission array.

10. [Original] The pulsed power application system of claim 1, wherein said means for transferring said optical energy and said electrical energy from said power supply to said x-ray tube is a single cable, said single cable comprising:

a waveguide configured to transfer optical energy to the x-ray tube,

an electrical conductor configured to transfer electrical energy to the x-ray tube, said electrical conductor surrounding at least a portion of said waveguide along a length of the cable; and

an insulation material disposed between said waveguide and said electrical conductor, said insulation material surrounding said waveguide and said electrical conductor.

11. [Currently Amended] An x-ray tube adapted to generate pulsed x-ray radiation comprising:

a frame;

an anode disposed in said frame;

a cathode corresponding with said anode disposed in said frame;

a power supply configured to provide optical energy and an anode-to-cathode gap voltage via electrical energy, said anode-to-cathode gap voltage is greater than 150kV, wherein said optical energy and said gap voltage are pulsed resulting in a pulsed x-ray radiation; and

a means for transferring said optical energy and said electrical energy from said power supply to said x-ray tube, said x-ray tube configured for diagnostic imaging.

12. [Currently Amended] The x-ray tube of claim 11, wherein said optical energy and said gap voltage is pulsed, said gap voltage is pulsed by pulsing an output~~the extraction~~ voltage of said power supply.

13. [Original] The x-ray tube of claim 11, wherein said power supply includes a positive terminal in electrical communication with said anode and a negative terminal in electrical communication with said cathode, wherein said power supply generates a pulsed emission current resulting in the pulsed x-ray radiation from said anode.

14. [Currently Amended] The x-ray tube of claim 11, wherein the x-ray tube is bipolar and said anode is connected to a positive terminal of a first power supply of said power supply and said cathode is connected to a negative terminal of a second power supply of said power supply, remaining terminals of said first and second power supply are referenced to ground.

15. [Original] The x-ray tube of claim 11, wherein said optical energy is generated by one of a laser, an LED, and an electroluminescent device in operable communication with said power supply and configured to generate pulsed photon energy at a suitable wavelength to optimize electron emission from an electron source.

16. [Original] The x-ray tube of claim 11, wherein said cathode includes a surface configured as an electron source to generate electrons triggered by photons directed at said surface, said photons generated from said optical energy.

17. [Original] The x-ray tube of claim 16, wherein said surface of said cathode is a prepared photo-emitting surface including at least one of clean metals, semi-conductor crystals, coated metal materials, coated oxide materials, and cleaved crystal edges.

18. [Original] The x-ray tube of claim 17, wherein said electron source includes a field emission array (FEA).

19. [Original] The x-ray tube of claim 18, wherein said field emission array (FEA) includes a Spindt-type field emission array.

20. [Original] The pulsed power application system of claim 11, wherein said means for transferring said optical energy and said electrical energy from said power supply to said x-ray tube is a single cable, said single cable comprising:

a waveguide configured to transfer optical energy to the x-ray tube,

an electrical conductor configured to transfer electrical energy to the x-ray tube, said electrical conductor surrounding at least a portion of said waveguide along a length of the cable; and

an insulation material disposed between said waveguide and said electrical conductor, said insulation material surrounding said waveguide and said electrical conductor.

21. [Currently Amended] A method to reduce the size for improving the efficiency of operation in x-ray tubes, the method comprising:

configuring a power supply to provide optical energy and electrical energy;

connecting said power supply to ~~an~~the x-ray tube configured for diagnostic imaging with a means for transferring said optical energy and said electrical energy from said power supply to the x-ray tube, the x-ray tube having an anode and a cathode disposed in the x-ray tube to provide a gap voltage therebetween, said gap voltage is greater than 150kV;

pulsing said gap voltage; and

generating a pulsed x-ray radiation from said anode.

22. [Original] The method of claim 21, wherein said means for transferring said optical energy and said electrical energy from said power supply to said x-ray tube is a single cable, said single cable comprising:

a waveguide configured to transfer optical energy to the x-ray tube,

an electrical conductor configured to transfer electrical energy to the x-ray tube, said electrical conductor surrounding at least a portion of said waveguide along a length of the cable; and

an insulation material disposed between said waveguide and said electrical conductor, said insulation material surrounding said waveguide and said electrical conductor.

23. [Currently Amended] A pulsed power application system for an x-ray tube comprising:

an x-ray tube having an anode and cathode, said x-ray tube configured for diagnostic imaging;

a power supply configured to provide optical energy generating photons and electrical energy generating an anode-to-cathode gap voltage said anode-to-cathode gap voltage is greater than 150kV; and

a pulsing means for pulsing said photons and said gap voltage resulting in a pulsed x-ray radiation;

a means for transferring said optical energy and said electrical energy from said power supply to said x-ray tube.

24. [Currently Amended] The pulsed power application system of claim 23 wherein said pulsing means includes at least one of, and includes combinations of at least one of:

pulsing an output~~the extraction~~ voltage of said power supply;

applying a grid voltage to control electron emission current; and

switching one of a switchable electron source in operable communication with the cathode.

25. [Currently Amended] A power supply cable for an x-ray tube comprising:

a waveguide configured to transfer optical energy to the x-ray tube, said x-ray tube configured for diagnostic imaging, said x-ray tube configured to generate an anode-to-cathode gap voltage greater than 150kV;

an electrical conductor configured to transfer electrical energy to the x-ray tube, said electrical conductor surrounding at least a portion of said waveguide along a length of the cable; and

an insulation material disposed between said waveguide and said electrical conductor, said insulation material surrounding said waveguide and said electrical conductor.

26. [Original] The cable of claim 25, wherein said electrical conductor includes two electrical conductors surrounding said at least a portion of said waveguide, said two electrical conductors configured to optimize a skin effect for pulsed power current transmission through said two electrical conductors.

27. [Original] The cable of claim 26, wherein each of said two electrical conductors is configured as a portion of a cylindrical wall disposed proximate a periphery of the cable to optimize said skin effect.

28. [Original] The cable of claim 25, wherein said electrical conductor is configured to use a transmission line effect of a pulse train of power to maximize voltage at the x-ray tube.

29. [Original] The cable of claim 25, wherein said waveguide includes one of an optical fiber and a bundle of optical fibers.

30. [Original] The cable of claim 25, wherein said waveguide is made from one of a plastic and a glass.

31. [Currently Amended] A method to reduce the size of a power cable supplying an x-ray tube, the method comprising:

employing an optical waveguide to transfer optical energy to an electron source triggered by photon energy to initiate release of electrons;

configuring an accelerating potential conductor taking into account skin effect to reduce the thickness thereof and circumferentially disposing about said waveguide, wherein said conductor is configured to use a transmission line effect of a pulse train of power to maximize voltage at the x-ray tube; and

disposing an insulating material between said conductor and said waveguide, said insulation material surrounding said conductor and a periphery of said waveguide.